

## Supplementary Online Content

Shen Y, Li C, Dong H, et al. Community outbreak investigation of SARS-CoV-2 transmission among bus riders in Eastern China. *JAMA Intern Med*. Published online September 1, 2020. doi:10.1001/jamainternmed.2020.5225

**eAppendix.** COVID-19 Case Report Form, Initiation of the Outbreak Investigation, Definition of COVID-19 Cases and Severity, Details of Spearman Rank Test, and Transmission Dynamics

This supplementary material has been provided by the authors to give readers additional information about their work.

## eAppendix.

### S.1 COVID-19 Case Report Form (CRF)

Case ID: .....

Patient ID: .....

#### CASE DEMOGRAPHICS

1. Name: .....

2. Sex:  M  F

#### CLINICAL INFORMATION

3. Hospital admission date: .....Year.....Month.....Day

4. Symptoms (select all that apply):

- Fever (Highest) .....°C  Chills  Cough  Sputum  Congestion nose  
 Runny nose  Sore throat  Headache  Fatigue  Dizziness  Muscular pain  
 Joint pain  Shortness of breath  Difficulty breathing  Chest tightness  
 Chest pain  Conjunctival hyperemia  Nausea  Vomiting  Diarrhea  Abdominal pain  Other

5. Date and time of the routine blood test on administration: .....Year.....Month.....Day (fill the first test result if multiple tests)

Results:

- White blood cells (WBCs) .....x10<sup>9</sup>/L  
Number of lymphocytes (L) .....x10<sup>9</sup>/L  
Percentage of lymphocytes (L) .....%  
Percentage of neutrophils (N) .....%

6. Complications:  Yes  No

If yes, specify (select all that apply):  Meningitis  Encephalitis  Bacteremia/Sepsis  
 Myocarditis  Acute lung injury/Acute respiratory distress syndrome (ALI /ARDS)  Acute kidney injury (AKI)  Epilepsy  Secondary bacterial pneumonia  Other, specify.....

7. Imagine findings of COVID-19 from Chest X-ray or CT?  Yes  No  Not done

If yes, specify date and time.....Year.....Month.....Day.

#### RISK AND EXPOSURE INFORMATION

8. Is the case:

- Health care worker  Pathogenic microbial detection staff  Wild animal close contacts  
 Poultry and livestock breeding staff  Centralized elderly care staff  Other, specify.....

If health care worker, please select:

- Doctor  Nurse  Disease control site staff  Laboratory testing staff  
 Other, specify.....

9. Pregnancy:  Yes, specify the gestational age.....(weeks)  No

10. Medical history (select all that apply)

- No Hypertension Diabetes Cardio-cerebrovascular disease Asthma  
Chronic lung disease (Chronic obstructive pulmonary disease Other) Tumor  
Lung cancer Other) Chronic kidney disease Chronic liver disease  
Immunodeficiency diseases Other

Ask about exposures 14 days before symptom onset:

11. Is case a close contact with a confirmed case and confirmed during the isolation medical observation period: Yes No
12. Does case have travel/residence history in Wuhan City and its surrounding areas or other communities with case reports: Travel history Residence history No
13. Does case contact with people who has travel/residence history in Wuhan City and its surrounding areas or who has fever or respiratory symptoms in the communities with case reports: Yes No
14. Does case contact with people who has travel/residence history in Wuhan City and its surrounding areas or other communities with case reports? Yes No
15. Does case contact with a symptomatic/asymptomatic confirmed case: Yes No
16. In the same family, work place, kindergarten or school of the case, any clustering epidemic reported? Yes No unknown

**LABORATORY INFORMATION**

Specimen Type	Date Collected (Year/Month/Day)	Test Results (positive, negative, pending)
Throat swab		
Nasal swab		
Nasopharyngeal swab		
Sputum		
Tracheal secretions		
Tracheal aspirate		
Alveolar lavage fluid		
Blood specimen		
stool		
Other, specify		
Not collected		

Organization's name: .....

Investigator's name: .....

Date of Report: .....Year.....Month.....Day.

## **S.2 Initiation of the Outbreak Investigation**

The index patient was diagnosed with COVID-19 on January 27. During the epidemiologic investigation we learned that she attended the worship event on January 19. On January 28, another confirmed case was reported to the Haishu District of Ningbo city. The second patient also attended the same worship event on January 19. At the time, there were not a lot of confirmed COVID-19 cases in Ningbo city (a total of 20 confirmed cases by January 28). This immediately raised a red flag, and the local CDC staff started a field investigation at the temple on January 29. On the same day, a third confirmed cases reported to have attended the worship event, suggesting a high risk of cluster outbreak of the January 19 worship event. The local CDC staff obtained a full name list of the participants of the event on January 30 and started to contact all participants of the worship event. On January 31, five additional participants were confirmed with COVID-19. Thorough epidemiologic investigation with contact tracing was initiated on February 1.

During the epidemiologic investigation process, a standard case report form was used to collect basic information of each confirmed case. Questions on social activities and possible exposures were asked through phone or in-person interviews conducted during the outbreak investigation. For example, we asked about each participant's activity on January 19, including how each of them travelled to the temple and places they visited on that day. We also asked questions regarding food sharing and small group gathering. After more secondary cases were identified, a striking finding caught our attention, i.e. most of the confirmed cases took Bus 2 to the temple, and no one on a parallel bus was infected. We then obtained seat information of the passengers on Bus 2 to investigate if many of them were in close contact with the index patient, following a literature on NEJM reporting potential transmission of SARS on an airplane (Olsen et al. 2003). The high- and low- risk zone

definition was then based on the same study and several related literatures following WHO/CDC guidelines.

### **S.3 Definition of COVID-19 cases**

Suspected cases were defined based on exposure history and clinical manifestations of COVID-19. Specifically, an individual was diagnosed as a suspected case if the individual had any two of the clinical manifestations of COVID-19 plus any one of the epidemiologic criteria as described below:

#### **A. Clinical manifestations:**

- 1) fever;
- 2) abnormal radiology changes in the lungs suggesting pneumonia;
- 3) having normal or low white blood cell counts, or lower lymphocytes counts in the beginning of the disease.

#### **B. Epidemiologic criteria:**

- 1) In 14 days before symptoms onset, the patient travelled to or returned from Wuhan or other areas where there were reported cases of COVID-19;
- 2) In 14 days before symptoms onset, the patient had contact with patients having fever or respiratory symptoms with recent travel histories to Wuhan or other areas where there were reported cases of COVID-19;
- 3) The patient was exposed to a clustered outbreak of COVID-19;

Here, a clustered outbreak of COVID-19 is defined as the identification of two or more cases in a small region (e.g. a family, a construction site, a working place, etc.) within 14 days, with evidences of human-to-human transmission through close contacts or concurrent exposures to a transmission source.

A suspected case having any of the following was defined as a confirmed case:

- 1) Throat swab or blood sample tested positive for COVID-19 by real time polymerase chain reaction (RT-PCR) test;

2) Sequencing analyses of the virus genome identified virus genome that shares high similarity with the novel coronavirus from throat swab or blood samples.

#### **S.4 Definition of COVID-19 severity**

According to the severity of COVID-19, the disease was classified as mild, moderate, and severe (including critically ill) conditions at confirmation of infection as follows:

##### Mild COVID-19

Very mild clinical symptoms with no abnormality in radiology of the lungs.

##### Moderate COVID-19

Have some clinical symptoms, such as fever, coughing, and other respiratory symptoms, and radiology scan shows pneumonia.

##### Severe COVID-19

Adults having any of the following conditions:

- Shortness of breath, respiratory rate  $\geq 30$  breaths per minute (bpm);
- Resting peripheral capillary oxygen saturation (SpO<sub>2</sub>)  $\leq 93\%$ ;
- The ratio of arterial oxygen partial pressure to fractional inspired oxygen (PaO<sub>2</sub>/FiO<sub>2</sub>)  $\leq 300$  mmHg.

Or children having any of the following conditions:

- Shortness of breath not caused by fever or crying: respiratory rate (RR)  $\geq 60$  bpm for infant less than 2 months; RR  $\geq 50$  bpm for infant aged 2-12 months; RR  $\geq 40$  bpm if aged 1-5 years; RR  $\geq 30$  bpm if older than 5 years;
- Resting peripheral capillary oxygen saturation (SpO<sub>2</sub>)  $\leq 92\%$ ;
- Trouble breathing, cyanosis, or apnea;
- Lethargy or convulsion;
- Dehydration.

##### Critically ill COVID-19

Patient with any of the following conditions:

- Have respiratory failure and require mechanical respiration;



- Shock;
- Failure of other organs and require intensive care.

## **S.5 Details of Spearman's rank test**

The Spearman's rank correlation test was performed to test the correlation between the severity of infected cases and their proximities to the index patient in bus 2. The severity level of the asymptomatic, mild or moderate case was numbered as 1, 2 or 3, respectively.

Distance from the index patient to each of the infected cases was calculated, by considering the number of seats in between and the aisle is counted as one unit of distance. For example, the distance from the index patient to case 13 was 4 and the corresponding severity level was 3 (moderate).

## S.6 Transmission dynamics within participants directly involved in the outbreak and individuals indirectly affected by the outbreak

The bar plot of the outbreak (Figure S1) shows the number of lay Buddhist passengers with documented disease onset dates from January 17 to February 22, with patients categorized by chain of infection (up to the quinary transmission) inferred from contact-tracing in our epidemiologic investigation. In the bar plot, the index patient is denoted as 1, cases of secondary transmission are denoted as 2, with other numbers of different colors denoting different generations of transmission. It also marks important dates in outbreak 1, including the disease onset of the index patient (January 19), date of identifying the case outbreak (January 27), and the date to start investigating and isolating close contacts (February 1). For the investigation of airborne transmission in Bus 2, we only included confirmed cases who attended the worship event on January 19. A significant portion of the confirmed cases from the worship event became sources of infection in their household/community and transmission went on beyond the second generation. Figure S2 documents the transmission dynamics in the outbreak.

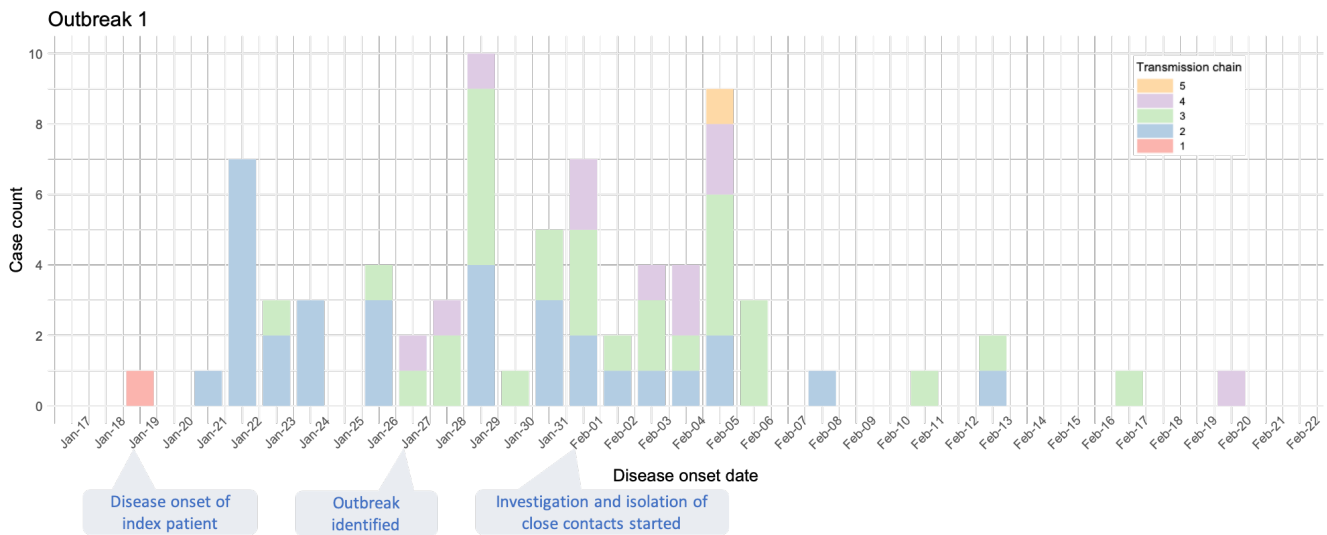


Figure S1: Disease onset dates of lay Buddhist passengers relative to the index patient who took Bus 2. Transmission chain:

1 - Index patient; 2 - Secondary cases; 3 - Tertiary cases; 4 - Quaternary cases; 5 – Quinary cases.

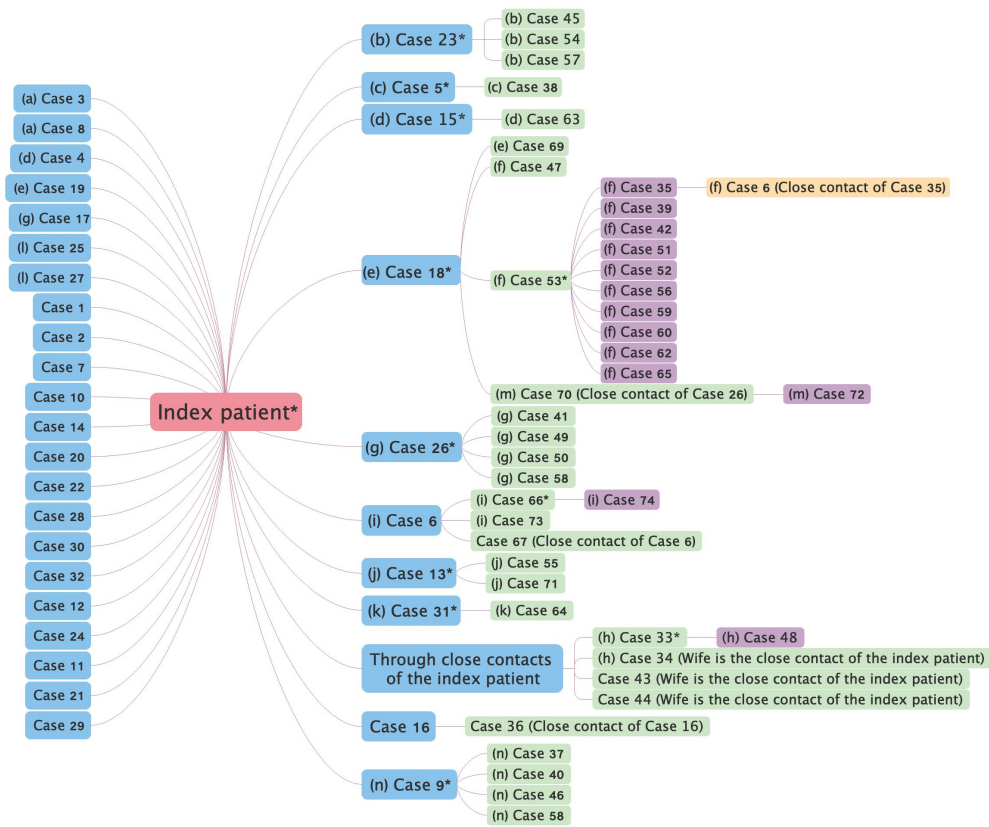


Figure S2: Treeplot of chain of infection from the index patient in the outbreak. (x): cases marked with (x) belong to the same family, e.g. case 23, 45, 54 and 57 belong to family (b). \*: cases marked with \* transmitted to others.